Polar Mesospheric Cloud Imaging and Tomography Experiment

Problem Statement

• These flights will validate an integrated atmosperic observatory that will gain *in-situ* data within a noctilucent cloud (NLC) layer, producing unparalleled insight into NLC dynamics through analysis of embedded micro-features.

• These flights will serve to validate and optimize the integrated imager system to produce tomography of upper atmospheric phenomena, esp. NLCs.

• The observatory could be used for environmental imagery (e.g. fires, disaster scenes), upper atmospheric imagery, real-time tactical planning in operational ground campaigns, and the acquisition of space weather data.

Technology Development Team

• PI Jason D. Reimuller, Space Science Institute, jreimuller@spacescience.org

• Support from the Space Science Institute, Northwest Research Associates, the Laboratory for Atmospheric and Space Physics, and Astronauts4hire, Inc.

• Technology Development from Integrated Spaceflight Services LLC

Proposed Flight Experiment

Experiment Readiness:

• July 2014 (experiment must be performed in July, when NLCs are visible in the Northern Hemisphere)

Test Vehicles:

• The experiment will rely upon a manned suborbital, reusable launch vehicle. Currently, XCOR's Lynx Mark II vehicle offers most the cost-effective flexibility to meet the geographic and temporal constraints of the experiment.

Test Environment:

• The experiment package has been flown by the PI on airborne platforms to study NLCs in Northern Canada. The requested sRLV will provide a manned, stabilized platform that can transition altitudes where NLCs form (~83km)

Test Apparatus Description:

• The payload will consist of two still frame cameras and a high-definition video camera mounted within a space-rated enclosure. The enclosure will then be integrated onto an adjustable mount that will have servo motors that can adjust the azimuth and elevation and contain an Inertial Reference Unit (IRU), data transmitters, and a GPS receiver that will record and transmit specific geospatial data of the payload boresight.

Technology Maturation

• Optical Imager, DCS, and control system, and payload specialist interface integrated. System flight test on aircraft (TRL 5) – Mar 2014
• Mid-latitude suborbital system test and baseline observations (TRL 6) - Apr 2014
• Operational campaign from a high-latitude spaceport and data analysis completed (TRL 7) - Dec 2014

The cameras, DCS and Payload Specialist Interface are at TRL 5. The experiment will raise the TRL of the observatory to 6 after the mid-latitude flight (Apr 2014) and to 7 after the high-latitude suborbital campaign and data processing (Dec 2014).

Objective of Proposed Experiment

• Experiment will test theories of NLC formation, sublimation, advection, and the gravity wave and instability dynamics accounting for NLC spatial structures.

• Flight data will be a series of geo-referenced images taken through a variety of imager settings.

OCT Technology Area 8 (Science Instruments, Observatories, and Sensor Systems (SIOSS) Technology Area Roadmap)